

SYNLETT

Spotlight 60

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

Pyrrolidine-2-carboxylic Acid (L-Proline)

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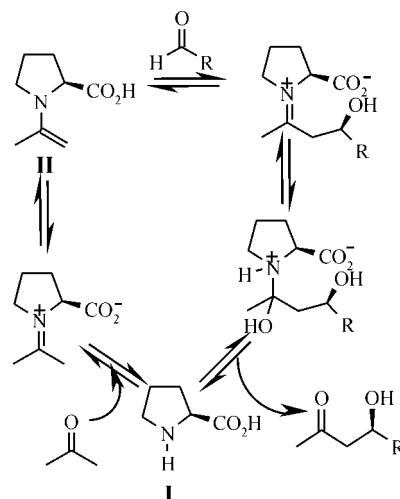
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Introduction

Pyrrolidine-2-carboxylic acid commonly known as L-Proline (**I**) has shown, in recent times, excellent catalytic activity, in catalyzing a wide variety of reactions such as aldol,^{1,2} Mannich,^{3–5,10–12} Michael,^{6–9} in a highly enantioselective manner. These reactions have produced a variety of useful chiral materials for organic synthesis.

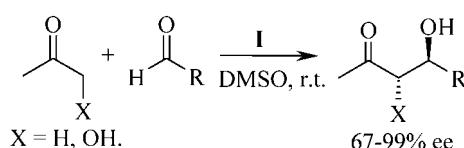
Most of the L-Proline (**I**) catalyzed reactions are believed to involve enamine (**II**) as key intermediate in its catalytic cycle (Scheme 1).



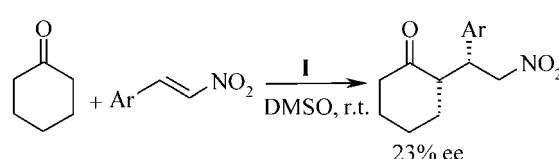
Scheme 1 Proline – catalytic cycle for aldol reaction.

Abstracts

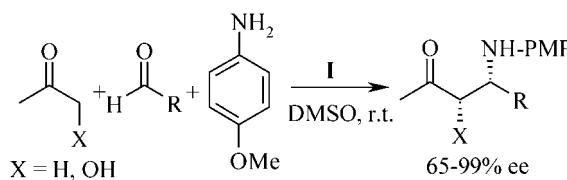
L-Proline (**I**) catalyzes the asymmetric aldol reaction between acetone and various aldehydes. In the case of hydroxy acetone, it gives *anti*-diols in excellent diastereo- and enantioselectivities.^{1,2}



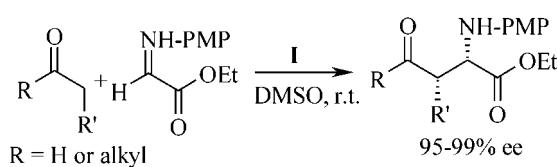
L-Proline catalyzes the Michael reaction of ketones with nitro olefins to provide a variety of chiral Michael addition products.^{6–9}



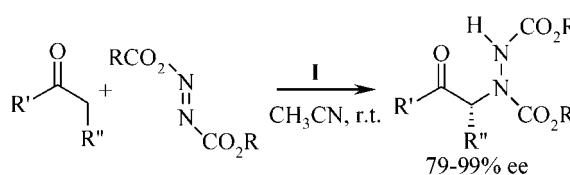
L-Proline catalyzes asymmetric the three component coupling involving Mannich reaction of acetone aldehydes and aryl amines to give β -amino ketones. In case of hydroxyacetone it gives α -hydroxy β -amino ketones in good to excellent ee. This reaction complements the Sharpless asymmetric aminohydroxylation.^{3–10}



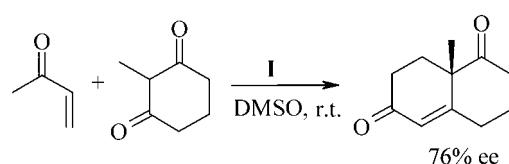
L-Proline catalyzes Mannich type reaction of protected α -imino ethyl glyoxylate with a variety of ketones to provide functionalized α -amino acids in high enantioselectivities.^{11,12}



L-Proline catalyzes α -amination of ketones by applying azodicarboxylate as nitrogen source to give chiral α -hydrazino, α -amino ketones, and alcohols.¹³



Recently, I has proved to be the best catalyst for asymmetric Robinson annulation.⁵



References

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